CLAIMS

I/We claim:

1. A method of locating a marker associated with a patient, said marker having a marker resonant frequency, the method comprising:

(a) applying an excitation at one of a set of frequencies to said marker using an excitation source;

(b) receiving a set of plurality of inputs indicative of a sensed magnetic flux induced by said marker in response to said excitation at said one of a set of frequencies;

(c) iteratively repeating steps (a)-(b) for all of the elements in said set of frequencies;

(d) identifying said marker resonant frequency based upon the multiple sets of plurality of inputs;

(e) adjusting said excitation source to provide further excitation at said marker resonant frequency;

(f) receiving a resonance set of plurality of inputs indicative of a sensed magnetic flux induced by said marker in response to said excitation at said marker resonant frequency; and

(g) analyzing said resonance set of plurality of inputs to determine said location of said marker.

2. The method of Claim 1 further including initiating multiple excitations at said marker resonant frequency and averaging said resonance set of plurality of inputs over said multiple excitations.

3. The method of Claim 1 wherein said set of frequencies has elements that have frequencies that are spaced apart.

4. The method of Claim 3 wherein the elements have frequencies that are uniformly spaced apart.

5. The method of Claim 3 wherein said set of frequencies has elements that span a marker resonant frequency range.

6. A method of determining a marker resonant frequency of a marker associated with a patient, the method comprising:

(a) applying an excitation at one of a set of frequencies to said marker using an excitation source;

(b) receiving a set of plurality of inputs indicative of a sensed magnetic flux induced by said marker in response to said excitation at said one of a set of frequencies;

(c) iteratively repeating steps (a)-(b) for all of the elements in said set of frequencies; and

(d) identifying said marker resonant frequency based upon the multiple sets of plurality of inputs.

7. The method of Claim 6 further including initiating multiple excitations at said marker resonant frequency and averaging said resonance set of plurality of inputs over said multiple excitations.

8. The method of Claim 6 wherein said set of frequencies has elements that have frequencies that are spaced apart.

9. The method of Claim 8 wherein the elements have frequencies that are uniformly spaced apart.

10. The method of Claim 8 wherein said set of frequencies has elements that span a marker resonant frequency range.

11. An apparatus for determining a marker resonant frequency of a marker associated with a patient, the apparatus comprising:

(a) an excitation source for applying an excitation at one of a set of frequencies to said marker using an excitation source;

(b) a receiver for receiving a set of plurality of inputs indicative of a sensed magnetic flux induced by said marker in response to said excitation at said one of a set of frequencies;

(c) means for iteratively repeating steps (a)-(b) for all of the elements in said set of frequencies; and

(d) means for identifying said marker resonant frequency based upon the multiple sets of plurality of inputs.

12. The apparatus of Claim 11 further including means for initiating multiple excitations at said marker resonant frequency and averaging said resonance set of plurality of inputs over said multiple excitations.

13. The apparatus of Claim 11 wherein said set of frequencies has elements that have frequencies that are spaced apart.

14. The apparatus of Claim 13 wherein the elements have frequencies that are uniformly spaced apart.

15. The apparatus of Claim 13 wherein said set of frequencies has elements that span a marker resonant frequency range.

16. A system for locating a marker associated with a patient comprising:

an excitation source emitting an exciting waveform during an excitation interval, said exciting waveform causing said marker to resonate;

a sensing array including a plurality of sensing coils, said sensing coils outputting a plurality of inputs; and

a receiver for analyzing said plurality of inputs to remove noise from said plurality of inputs, said receiver acting on said plurality of inputs provided during a observation

interval, wherein said receiver includes a ring time control processor that allows the adjustment of the interval of said observation interval.

17. The system of Claim 16 wherein said adjustment of said interval of said observation interval is automatically performed by said receiver.

18. The system of Claim 16 wherein said excitation source repeats said exciting waveform repetitively and said receiver averages said plurality of inputs over a plurality of said observation intervals prior to analysis.

19. A system for locating a marker associated with a subject comprising:

an excitation source for emitting an exciting waveform during an excitation interval, said exciting waveform causing said marker to resonate;

a sensing array including a plurality of sensing coils, said sensing coils collectively outputting a plurality of inputs during a observation interval; and

a receiver that window filters said plurality of inputs.

20. The system of Claim 19 wherein said window filter is a Blackman window.

21. The system of Claim 20 wherein said receiver is a coherent receiver.

22. The system of Claim 21 wherein said receiver identifies and corrects a phase shift from said plurality of inputs.

23. A method for locating a marker associated with a subject comprising:

providing an excitation source to emit an exciting waveform during an excitation interval, said exciting waveform causing said marker to resonate;

providing a sensing array including a plurality of sensing coils, said sensing coils collectively outputting a plurality of inputs during a observation interval; and

providing a receiver that window filters said plurality of inputs.

24. The method of Claim 23 wherein said window filter is a Blackman window.

25. The method of Claim 23 wherein said receiver is a coherent receiver.

26. The method of Claim 23 wherein said window filter is a matched filter.

27. The method of Claim 25 wherein said receiver identifies and corrects a phase shift from said plurality of inputs.

28. A method of determining a marker resonant frequency of a marker associated with a patient, the method comprising:

(a) applying an excitation at one of a set of frequencies to said marker using an excitation source;

(b) receiving a set of plurality of inputs indicative of a sensed magnetic flux induced by said marker in response to said excitation at said one of a set of frequencies;

(c) repeating steps (a)-(b) for all of the elements in said set of frequencies;

(d) interpolating a frequency response to based upon the information obtained from steps (a)-(c); and

(e) identifying said marker resonant frequency based upon the interpolation.

29. The method of Claim 28 wherein said set of frequencies has elements that have frequencies that are spaced apart by a predetermined percentage.

30. The method of Claim 29 wherein said set of frequencies has elements that span a marker resonant frequency range.

28. A method of determining a marker resonant frequency of a marker associated with a patient, the method comprising:

(a) applying an excitation at one of a first set of frequencies to said marker using an excitation source;

(b) receiving a set of plurality of inputs indicative of a sensed magnetic flux induced by said marker in response to said excitation at said one of a set of frequencies;

(c) repeating steps (a)-(b) for all of the elements in said first set of frequencies;

(d) identifying a frequency band that contains said marker resonant frequency;

(e) formulating a second set of frequencies within said frequency band and repeating steps (a)-(b) for all of the elements in said second set of frequencies; and

(f) identifying said marker resonant frequency based on the response from step (e).

29. The method of Claim 29 wherein said first set of frequencies has elements that span a marker resonant frequency range.

30. A method of determining a marker resonant frequency of a marker associated with a patient, the method comprising:

(a) applying a broadband excitation to said marker using an excitation source, said broadband excitation having frequency components within a marker resonant frequency range;

(b) receiving a set of plurality of inputs indicative of a sensed magnetic flux induced by said marker in response to said broadband excitation; and

(c) identifying said marker resonant frequency based on said set of plurality of inputs.

31. The method of Claim 30 wherein said broadband excitation is applied multiple times and multiple sets of plurality of inputs are gathered and averaged.